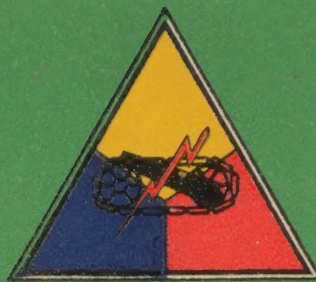


W
1
UN408



ARMORED MEDICAL RESEARCH LABORATORY

FORT KNOX, KENTUCKY

PARTIAL REPORT

INDEXED

ON

ANTHROPOMETRIC MEASUREMENTS

Subject: Size Increase of Men Wearing Various Clothing Combinations

ARMY
MEDICAL
MAY 27 1946
LIBRARY

INFORMATION COPY

Action copies have been forwarded to
Office of the Surgeon General, Occupa-
tional Hygiene Branch for approval and
execution.

Project No. 9

20 October 1945

ARMORED MEDICAL RESEARCH LABORATORY
Fort Knox, Kentucky

Project No. 9
SPMEA 741-3

20 October 1945

SIZE INCREASE OF MEN WEARING VARIOUS CLOTHING COMBINATIONS

1. PROJECT NO. 9 - Anthropometric Measurements. Partial Report.

a. Authority: Letter Chief, Combat Vehicle Branch, Development Division, OCO-D dated 14 August 1945.

b. Purpose: To furnish data on increase over nude measurements with various clothing combinations.

2. DISCUSSION:

The Armored Medical Research Laboratory was requested by Ordnance to furnish data on increase in size resulting from various clothing combinations, the data to be used by tank and vehicle designers in arriving at spacial requirements for vehicle crewmen.

Many of the measurements are subject to wide variability depending on snugness or looseness of fit, hang of cloth, etc. Table I gives minimum increase tabulation for certain clothing combinations. Figures 1 thru 9 give general idea of increase resulting from factors other than cloth thickness alone. Table II is reproduction of Army Air Force data on amounts added to nude dimensions by typical clothing outfits--Memo Report, Engineering-49-695-32, dated 18 August 1943.

3. CONCLUSIONS: None

4. RECOMMENDATIONS: None

Submitted by:

Lester B. Roberts, Major, SnC

APPROVED *William B. Bean*
WILLIAM B. BEAN
Major, Medical Corps
Commanding

2 Incls.

#1 - Tables I & II

#2 - Figures 1 thru 9

TABLE I

AMOUNTS ADDED TO NUDE DIMENSIONS BY CLOTHING ⁽¹⁾ (Inches)									
	Helmet, Liner, Khakis, Cotton Undershirt and Drawers, Socks and G.I. Shoes	Helmet, Liner, Field Jacket, Khakis, Cotton Underwear, Socks and G.I. Shoes	Helmet, Liner, Fatigues, Cotton Underwear, Shoes and Socks	Helmet, Liner, Gloves, Wool Cap, Fatigues, Combat Suit, Cot. Under wear, Shoes and Socks	Helmet, Liner, O.D.'s, Cotton Underwear, Shoes and Socks	Same with Blouse	Same with Blouse and Overcoat	Same with Field Jacket	Helmet, Liner, Cap, Cotton Underwear, Fatigues, Combat Suit, Gloves, Over coat, Shoes and Socks
Weight (pounds)	9.1	10.0	9.4	15.9	9.3	11.8	18.6	9.8	22.9
Stature ⁽²⁾ (inches)	2.65	2.65	2.65	2.75	2.65	2.65	2.65	2.65	2.75
Head Length	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5	3.5
Breadth	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8	2.8
Height ⁽³⁾	1.35	1.35	1.35	1.45	1.35	1.35	1.45	1.35	1.45
Arm - Total Span	-	-	-	.30	-	-	-	.30	.30
Span Akimbo	.04	.12	.04	.46	.04	.12	.36	.12	.70
Anterior Arm Reach	.04	.08	.04	.25	.04	.08	.20	.08	.37
Shoulder-Elbow Length (padding included)	.14	.28	.14	.34	.14	.50	.94	.28	.62
Shoulder Breadth (to bone) (seam or padding included)	.24	.44	.24	.52	.24	.88	1.52	.44	1.16
Shoulder Breadth (across muscle)	.04	.12	.04	.16	.04	.12	.36	.12	.40
Elbow Breadth (across body)	.56	1.04	.56	1.24	.56	1.04	1.84	1.04	2.12
Hand Length	-	-	-	.15	-	-	.15	-	.15
Hand Breadth	-	-	-	.30	-	-	-	-	.30
Trunk Sitting Height	1.39	1.43	1.39	1.55	1.39	1.39	1.61	1.39	1.67
Eye Level from Seat	.04	.08	.04	.10	.04	.04	.16	.04	.22
Shoulder to Seat	.16	.30	.16	.36	.16	.48	.92	.58	.80
Chest Depth	.21	.96	.41	.79	.21	.85	1.80	.85	1.54
Abdominal Depth	.94	1.18	.94	1.79	.94	1.18	1.95	1.18	2.54
Hip Breadth	.52	.72	.52	1.08	.56	.76	1.08	.76	1.40
Buttock Breadth	.52	.52	.52	1.08	.56	.76	1.08	.56	1.40
Buttock-Knee Leg (sitting)	.20	.20	.20	.46	.20	.30	.54	.30	.70
Knee Height ⁽²⁾ from Floor	1.32	1.32	1.32	1.32	1.32	1.32	1.44	1.32	1.44
Knees Breadth across Both	.48	.48	.48	1.04	.48	.48	.72	.48	1.68
Foot Length ⁽⁴⁾	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60	1.60
Foot Breadth ⁽⁴⁾	.20	.20	.20	.20	.20	.20	.20	.20	.20

(1) These data were calculated from maximum thickness measurements with a micrometer on one set of G.I. Clothing; unless otherwise noted.

(2) Shoe Height is a mean of 32 Height measurements on men with and without shoes.

(3) Head Height gains are from measurements on one man with and without head protection.

(4) From foot and shoe measurements on one man.

TABLE II

AMOUNTS ADDED TO NUDE DIMENSIONS BY TYPICAL CLOTHING OUTFITS

	Heavy Winter Flying Clothing ¹	Quilted "Feathertex" (Thomas Quilt) ²	Electrically Heated Suit (Type F-1) ³	Electric Suit G.E. 2-piece) ⁴
Weight	20 lbs.	14 lbs.	16 lbs.	15.5 lbs.
Stature	1.9 in.	1.9 in.	1.8 in.	1.2 in.
Head Length	0.4	0.4	0.4	0.4
Breadth	0.4	0.4	0.4	0.4
Height	0.2	0.2	0.2	0.2
Circumference	1.7	1.7	1.7	1.7
Arm				
Total Span	0.4	0.0	0.2	0.0
Span-Akimbo	0.8	0.0	0.4	0.0
Anterior Arm Reach	0.4	0.0	0.2	0.0
Shoulder-Elbow Length	0.3	0.3	0.5	0.5
Shoulder Breadth (to bone)	1.3	0.8	0.4	0.2
Shoulder Breadth (across muscle)	0.7	0.8	0.5	0.2
Elbow Breadth (across body)	4.4	4.7	2.4	2.9
Hand Length	0.3	0.4	0.4	0.2
Hand Breadth	0.4	0.3	0.2	0.2
Trunk				
Sitting Height	0.6	0.6	0.6	0.6
Eye Level from Seat	0.4	0.4	0.4	0.4
Shoulder to Seat	0.6	0.7	0.5	0.5
Chest Breadth	0.6	0.6	0.4	0.5
Chest Depth	1.4	1.7	0.7	0.7
Chest Circumference- resting	9.1	6.8	4.4	3.4
Abdominal Depth	1.4	2.2	0.4	0.8
Hip Breadth	1.3	2.1	0.4	0.8
Buttock Breadth	1.7	2.5	0.5	0.6
Leg				
Buttock-Knee (sitting)	0.5	1.1	0.4	0.3
Knee Height from Floor	1.8	2.2	1.6	1.9
Knees, Breadth across Both	2.5	2.1	2.5	1.0
Calf Circumference	6.0	3.9	1.6	1.8
Foot Length**	2.7	2.7	2.7	2.7
Foot Breadth**	1.2	0.9	0.7	0.9

¹B-3 jacket, A-3 trousers, B-5 helmet, A-9 gloves, A-6 boots.²SJ-4* jacket, ST-9* trousers, B-6 helmet, A-9 gloves, A-6 boots.³F-1 suit, B-5 helmet, A-6 gloves, A-9 boots, D-1 boot pilots.⁴PA-17-LI* jacket, PA-17-MI* trousers, B-6 helmet, PA-17-DI* gloves, A-6 boot, A-4 coverall.

* Manufacturer's numbers: Thomas Quilt Factories, Denver, Colorado; General Electric Company, Bridgeport, Connecticut.

* **Boot Measurements: A-6, medium: 12.8" long, 5.0" wide. A-6, large: 13.5" long, 5.3" wide. A-9, large: 13.2" long, 4.7" wide.

1. The first part of the report is devoted to a general description of the work done during the year. It includes a summary of the results of the various investigations carried out, and a statement of the progress made in the different branches of the science.

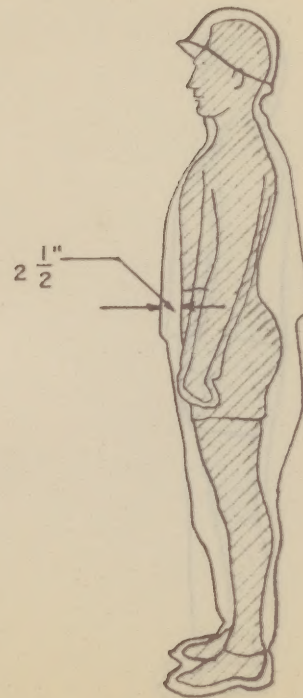
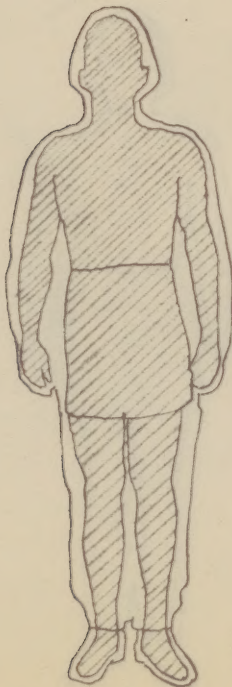
2. The second part of the report contains a detailed account of the work done in the different branches of the science. It includes a description of the methods used, and a statement of the results obtained.

3. The third part of the report is devoted to a discussion of the results obtained, and to a statement of the conclusions reached. It includes a summary of the main results, and a statement of the conclusions reached.

4. The fourth part of the report contains a list of the references used, and a list of the names of the persons who have assisted in the work.

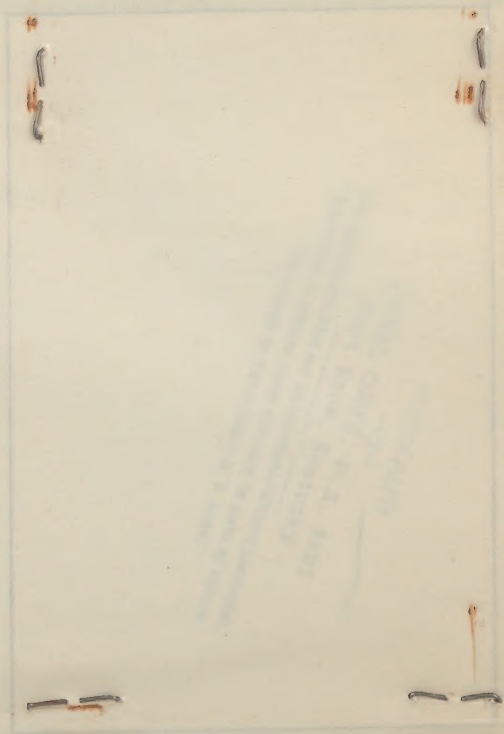
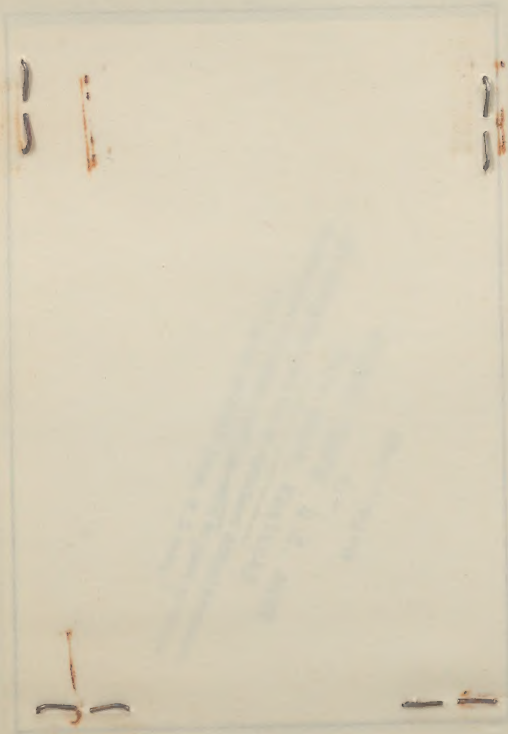
1. The first part of the report is devoted to a general description of the work done during the year. It includes a summary of the results of the various investigations carried out, and a statement of the progress made in the different branches of the science.	1. The first part of the report is devoted to a general description of the work done during the year. It includes a summary of the results of the various investigations carried out, and a statement of the progress made in the different branches of the science.	1. The first part of the report is devoted to a general description of the work done during the year. It includes a summary of the results of the various investigations carried out, and a statement of the progress made in the different branches of the science.	1. The first part of the report is devoted to a general description of the work done during the year. It includes a summary of the results of the various investigations carried out, and a statement of the progress made in the different branches of the science.	1. The first part of the report is devoted to a general description of the work done during the year. It includes a summary of the results of the various investigations carried out, and a statement of the progress made in the different branches of the science.
2. The second part of the report contains a detailed account of the work done in the different branches of the science. It includes a description of the methods used, and a statement of the results obtained.	2. The second part of the report contains a detailed account of the work done in the different branches of the science. It includes a description of the methods used, and a statement of the results obtained.	2. The second part of the report contains a detailed account of the work done in the different branches of the science. It includes a description of the methods used, and a statement of the results obtained.	2. The second part of the report contains a detailed account of the work done in the different branches of the science. It includes a description of the methods used, and a statement of the results obtained.	2. The second part of the report contains a detailed account of the work done in the different branches of the science. It includes a description of the methods used, and a statement of the results obtained.
3. The third part of the report is devoted to a discussion of the results obtained, and to a statement of the conclusions reached. It includes a summary of the main results, and a statement of the conclusions reached.	3. The third part of the report is devoted to a discussion of the results obtained, and to a statement of the conclusions reached. It includes a summary of the main results, and a statement of the conclusions reached.	3. The third part of the report is devoted to a discussion of the results obtained, and to a statement of the conclusions reached. It includes a summary of the main results, and a statement of the conclusions reached.	3. The third part of the report is devoted to a discussion of the results obtained, and to a statement of the conclusions reached. It includes a summary of the main results, and a statement of the conclusions reached.	3. The third part of the report is devoted to a discussion of the results obtained, and to a statement of the conclusions reached. It includes a summary of the main results, and a statement of the conclusions reached.
4. The fourth part of the report contains a list of the references used, and a list of the names of the persons who have assisted in the work.	4. The fourth part of the report contains a list of the references used, and a list of the names of the persons who have assisted in the work.	4. The fourth part of the report contains a list of the references used, and a list of the names of the persons who have assisted in the work.	4. The fourth part of the report contains a list of the references used, and a list of the names of the persons who have assisted in the work.	4. The fourth part of the report contains a list of the references used, and a list of the names of the persons who have assisted in the work.

THE FIRST PART OF THE REPORT IS DEVOTED TO A GENERAL DESCRIPTION OF THE WORK DONE DURING THE YEAR. IT INCLUDES A SUMMARY OF THE RESULTS OF THE VARIOUS INVESTIGATIONS CARRIED OUT, AND A STATEMENT OF THE PROGRESS MADE IN THE DIFFERENT BRANCHES OF THE SCIENCE.



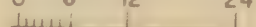
SCALE IN INCHES
 0 6 12 24

0 2 4 6 8 10 12 14 16 18 20
INCHES





SCALE IN INCHES
0 6 12 24



11 1

11 1

1 1

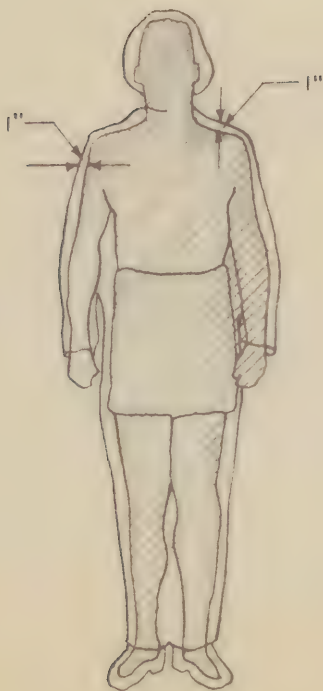
1 1

1 1

1 1

1 1

1 1



SCALE IN INCHES
0 6 12 24

FIG. 3

11

11

11

11

11

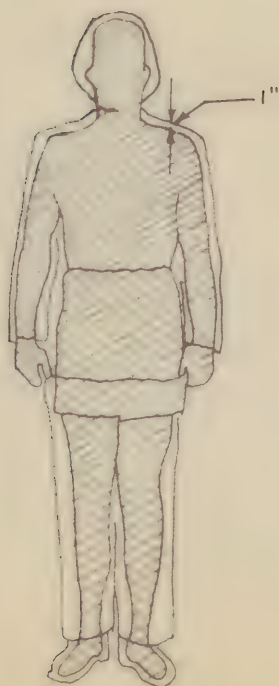
11

11

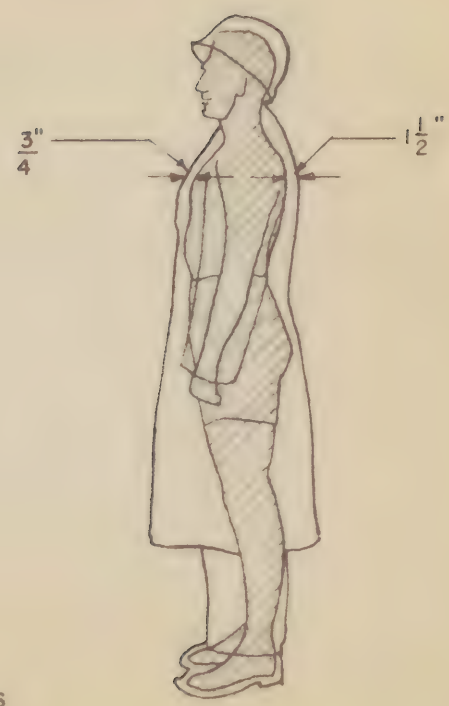
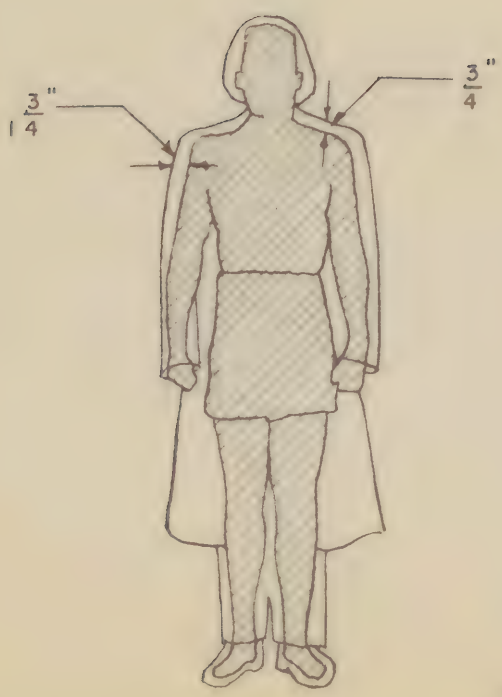
11



SCALE IN INCHES
0 6 12 24



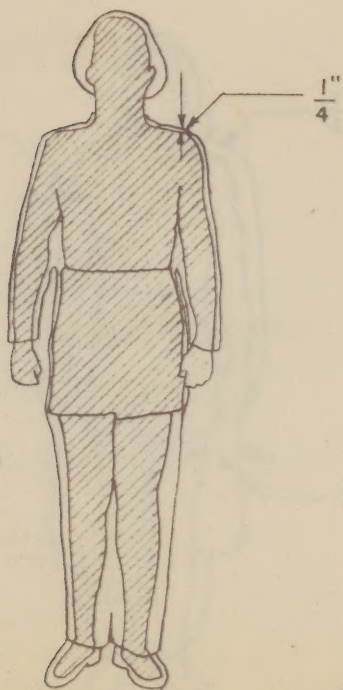
SCALE IN INCHES
0 6 12 24



SCALE IN INCHES
0 6 12 24

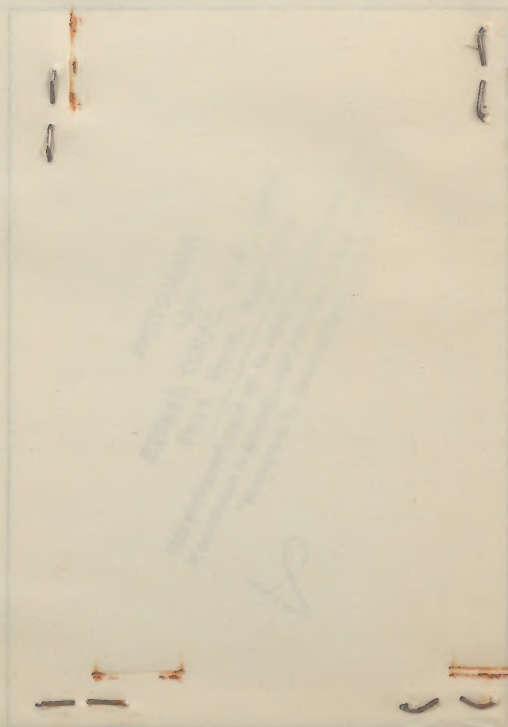
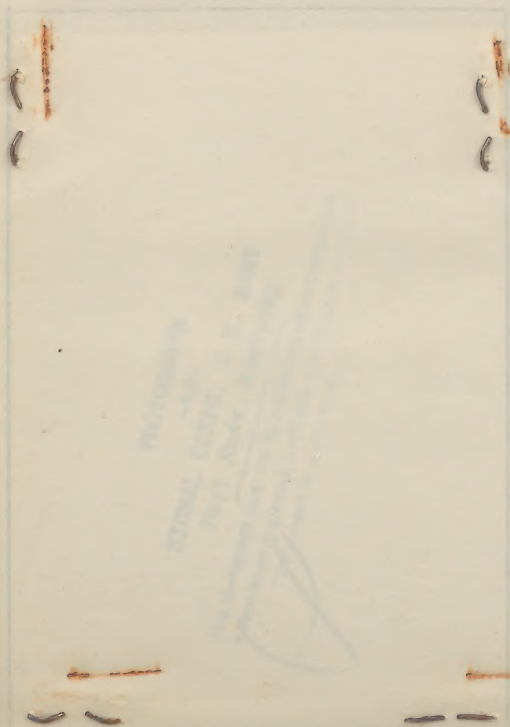


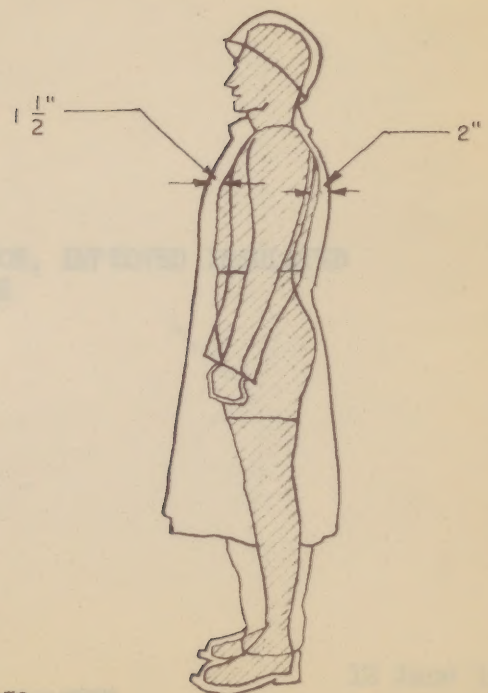
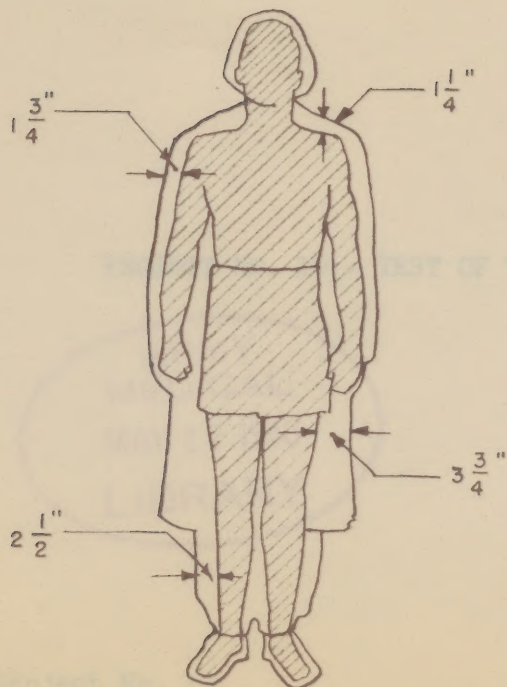
SCALE IN INCHES
0 6 12 24



SCALE IN INCHES
0 6 12 24

SCALE IN INCHES
0 1 2 3 4 5





SCALE IN INCHES
 0 6 12 24

SCALE IN INCHES
0 5 10 15 20

